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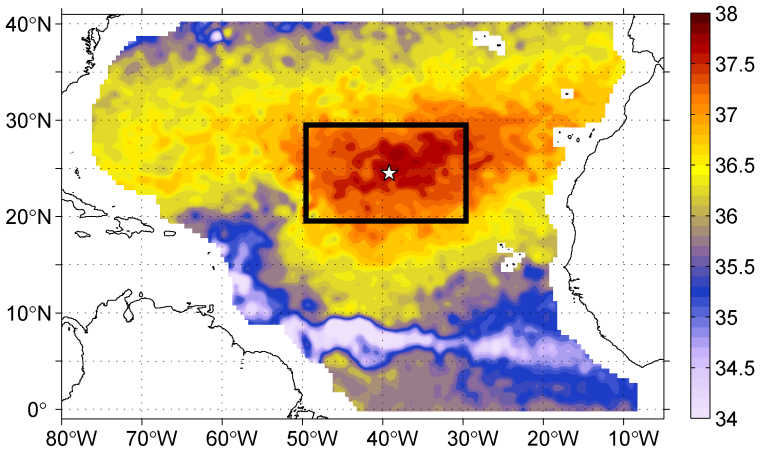
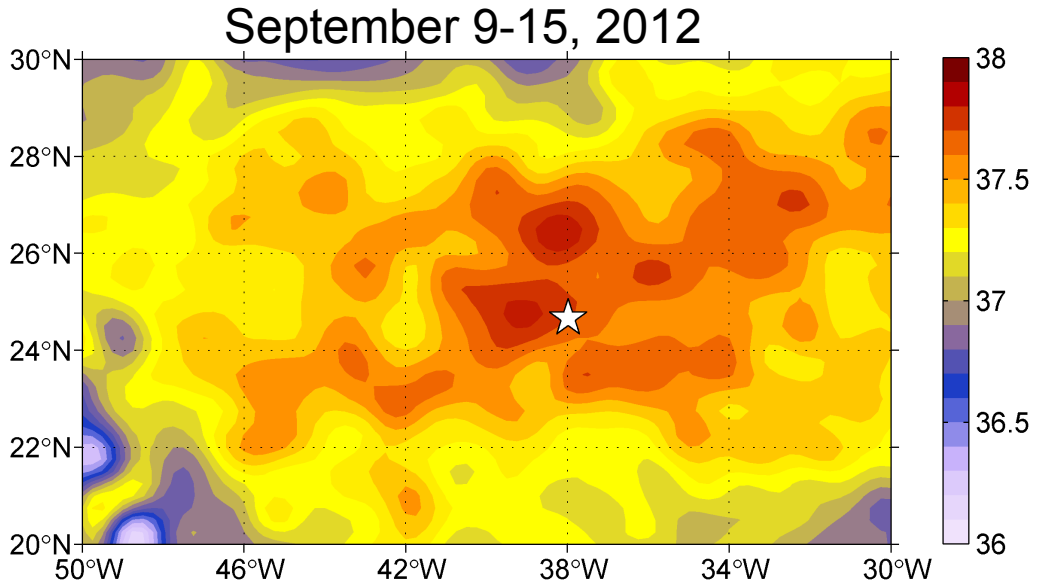
Aquarius OI SSS for SPURS





SPURS Meeting, Miami FL, 16-18 January 2013

Objective Interpolation (OI)

$$S^{(est)}(x) = \sum_i^n \sum_j^n A_{ij}^{-1} C_{xj} S_i^{(obs)}$$

Estimation at a grid-point ***x***

error covariance

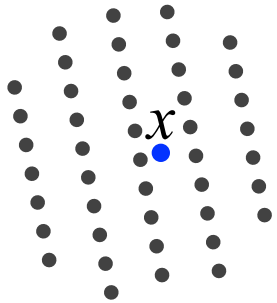
$$A_{ij} =< S_i^{(obs)} S_j^{(obs)} >=< S_i S_j > + < \varepsilon_i \varepsilon_j >$$

signal covariance

Covariance matrix for the observations

$$C_{xj} =< S(x) S_j >$$

Covariance between the observations and the field to be estimated



Error Covariance

1) $< \varepsilon_i \varepsilon_j >= \delta_{ij} \sigma_w$

Error covariance for points i, j not on the same track/beam and in the same cycle: white noise

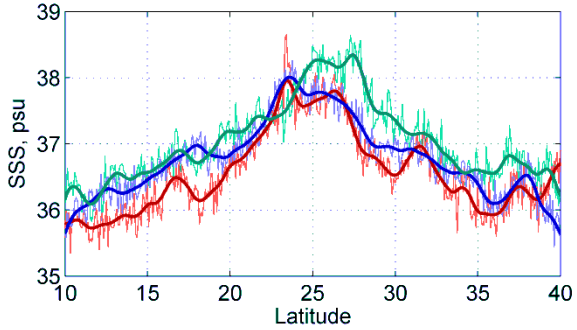
2) $< \varepsilon_i \varepsilon_j >= \delta_{ij} \sigma_w + \sigma_{long}$

Error covariance for points i, j on the same track/beam and in the same cycle: white noise + **long-wavelength error**

The idea has originally been developed for altimeter applications [e.g. Le Traon et al., 1998].

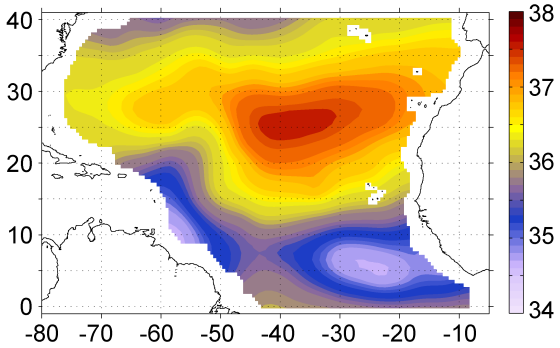
Input information for OI

Input data: Aquarius along-track SSS smoothed with a running Hanning filter of half-width of ~60 km



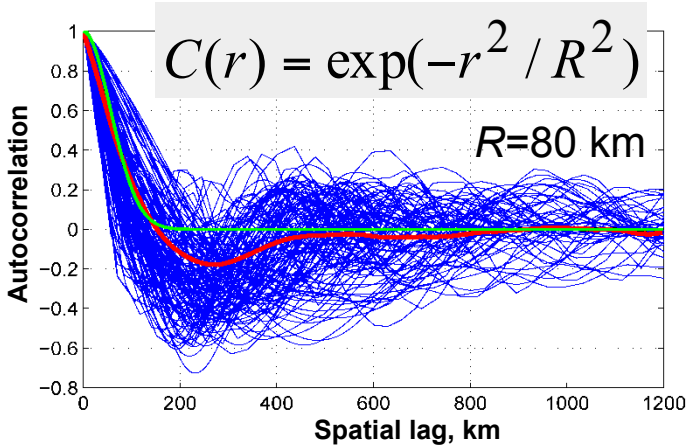
Example: 3 beams, 390-km wide swath (ascending) passing through the SPURS site on Sep 14, 2012

First guess: Argo-derived monthly SSS (IPRC product)



Example: October 2011

Signal covariance: from TSG lines in NA



Along-track/beam error covariance

A cosine function at L=2000 km dumped by an exponential decay

The variance of long-wavelength error = 50% of the signal variance.

Statistics of long-wavelength errors are inferred from Aquarius-HYCOM inter-comparison.

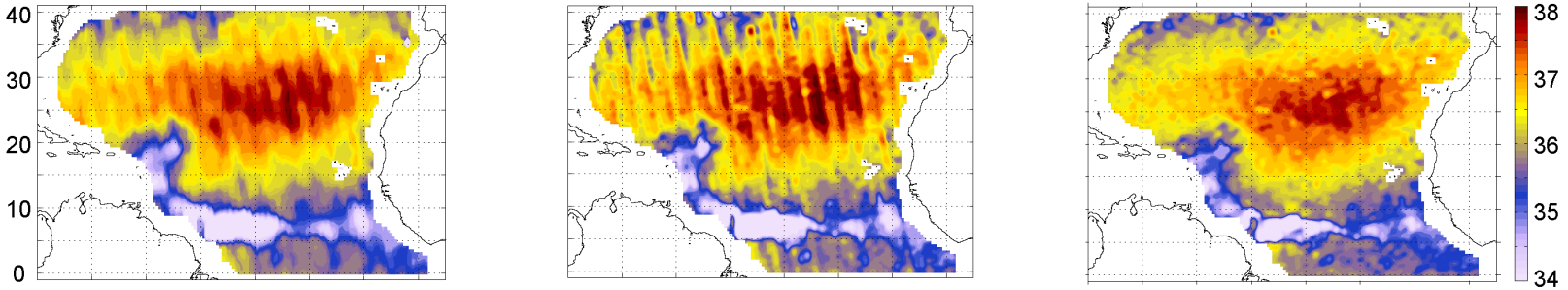
Bin-averaged (2-deg bins centered on a 0.5-deg grid)

Conventional OI (no inter-beam bias correction)

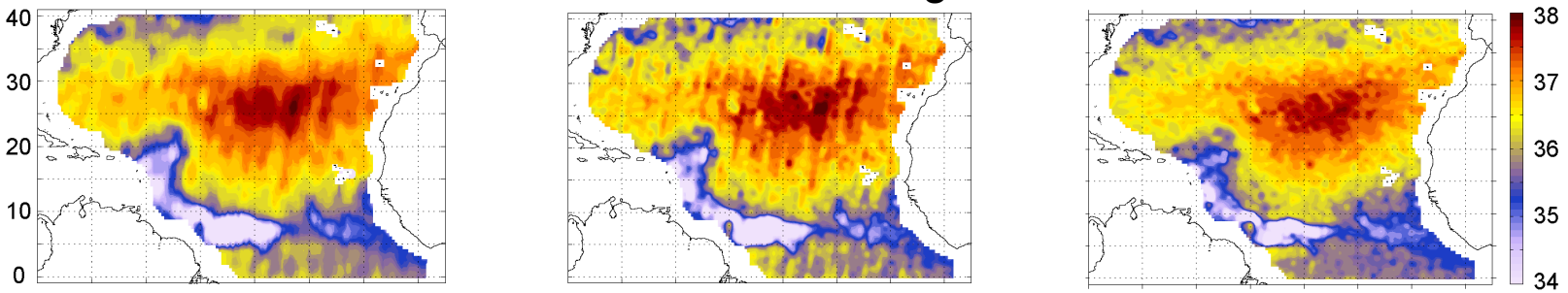
Advanced OI

Ascending

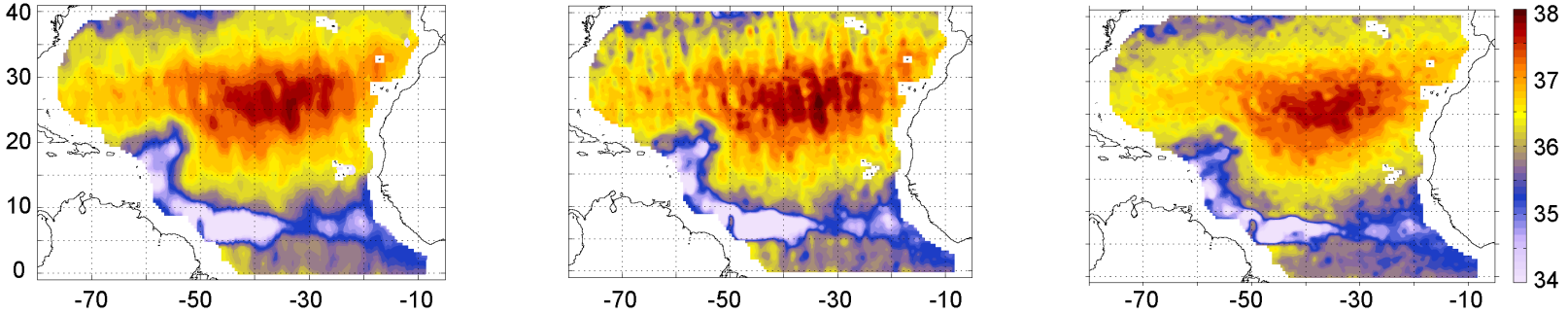
Aug 26-Sep 1, 2012



Descending

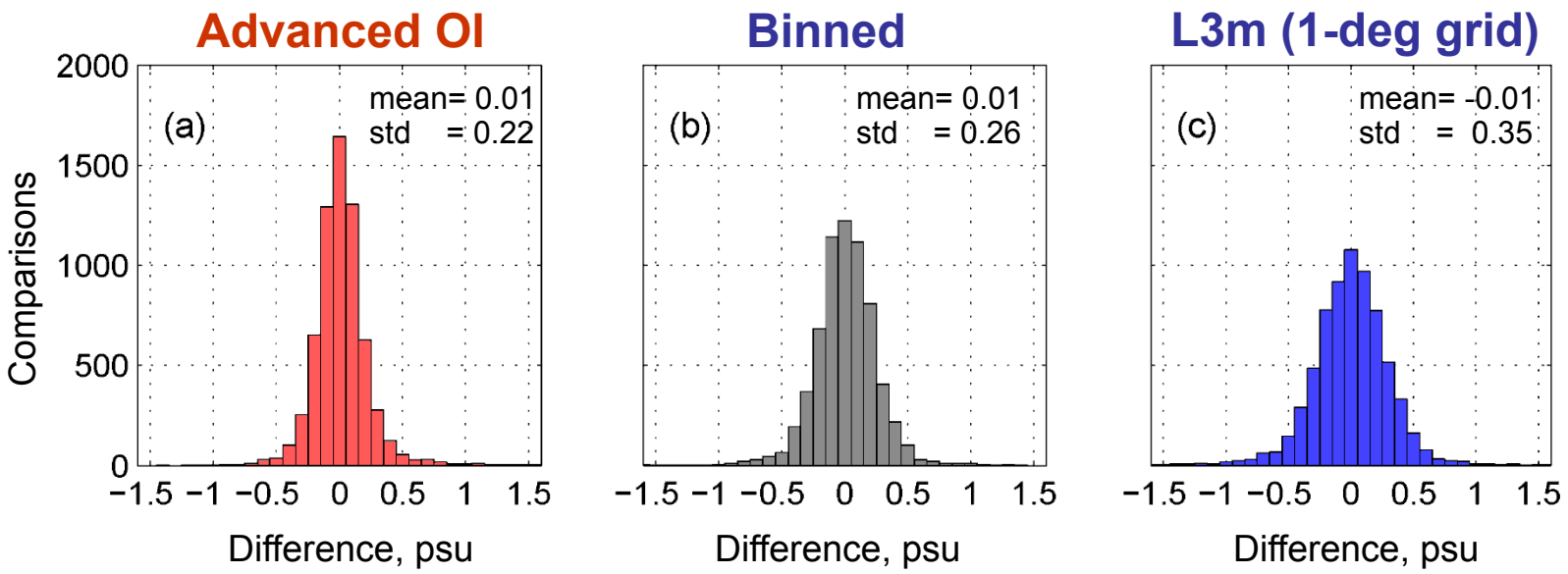


(Ascending+Descending)/2



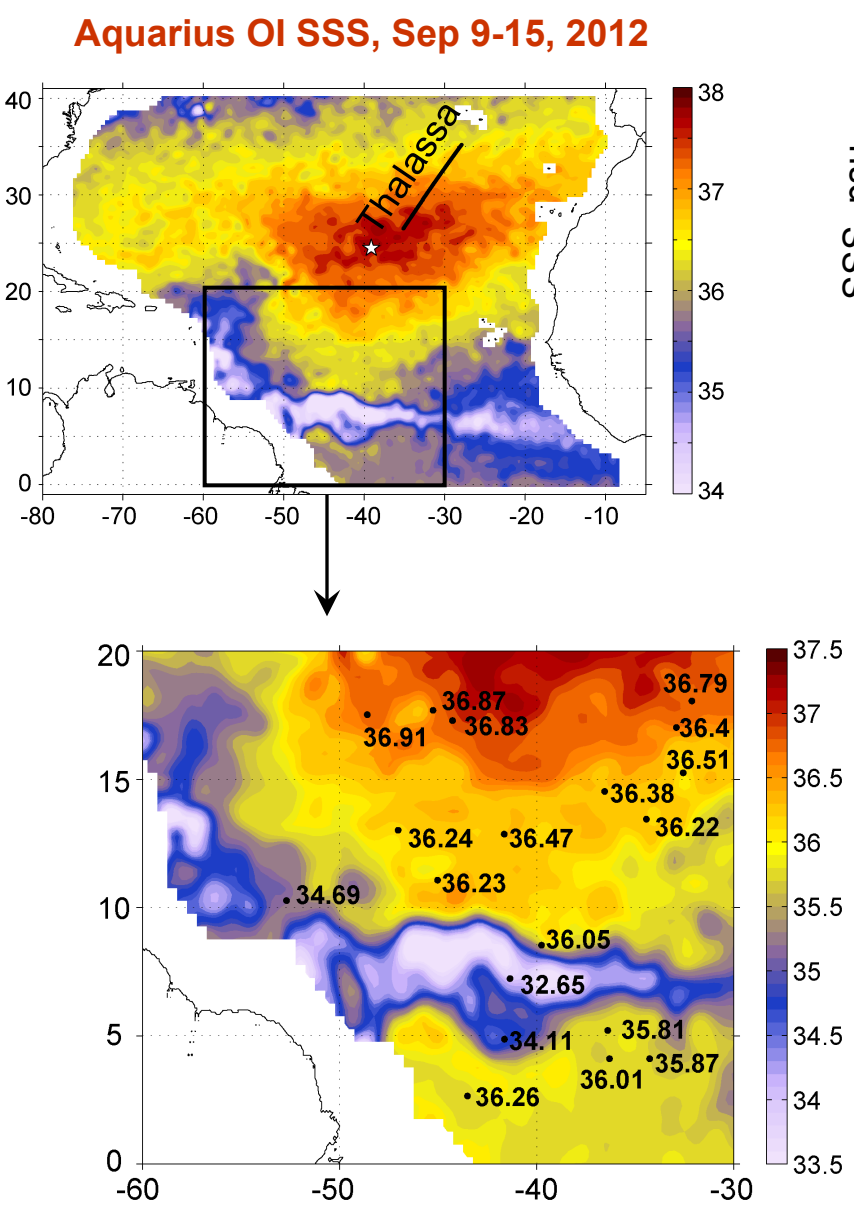
Inter-comparison of SSS analyses

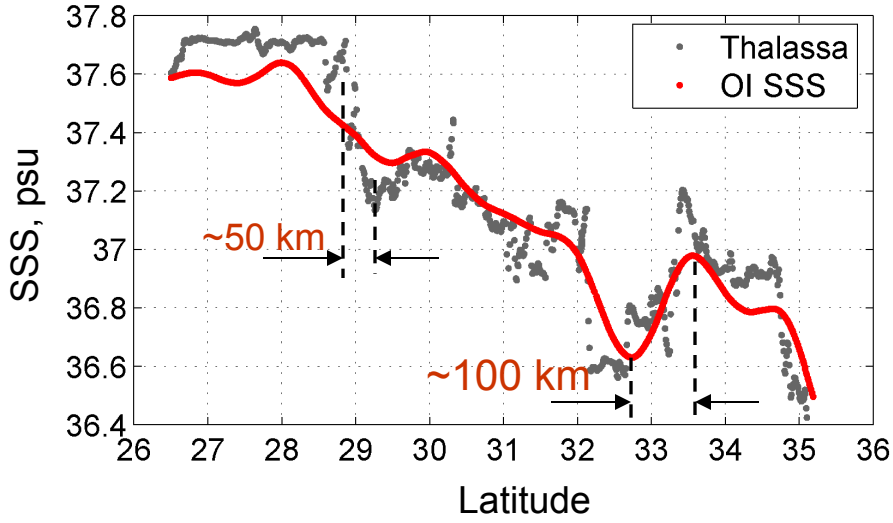
Statistics of the differences between Argo buoy data in the North Atlantic (0-40°N) and three Aquarius SSS analyses for the period from Sep 2011 through Nov 2012.



The error statistics are calculated by comparing Argo buoy measurements for a given week with SSS values at the same locations obtained by interpolating the corresponding Aquarius-derived maps.

Resolution issues

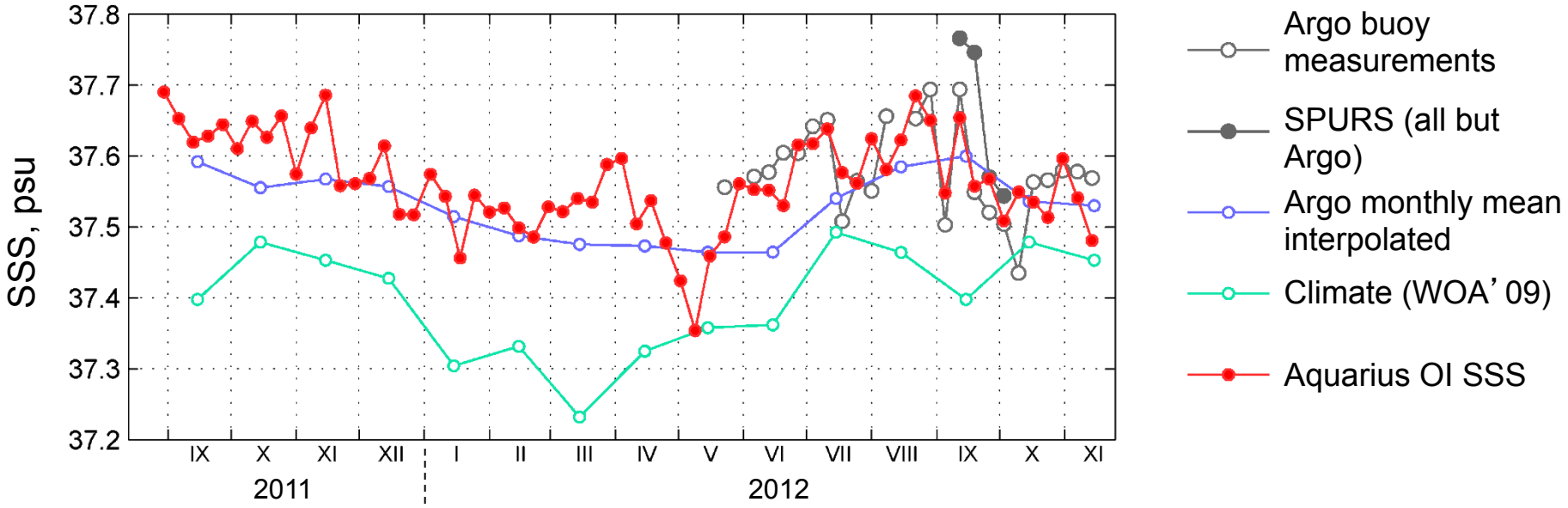




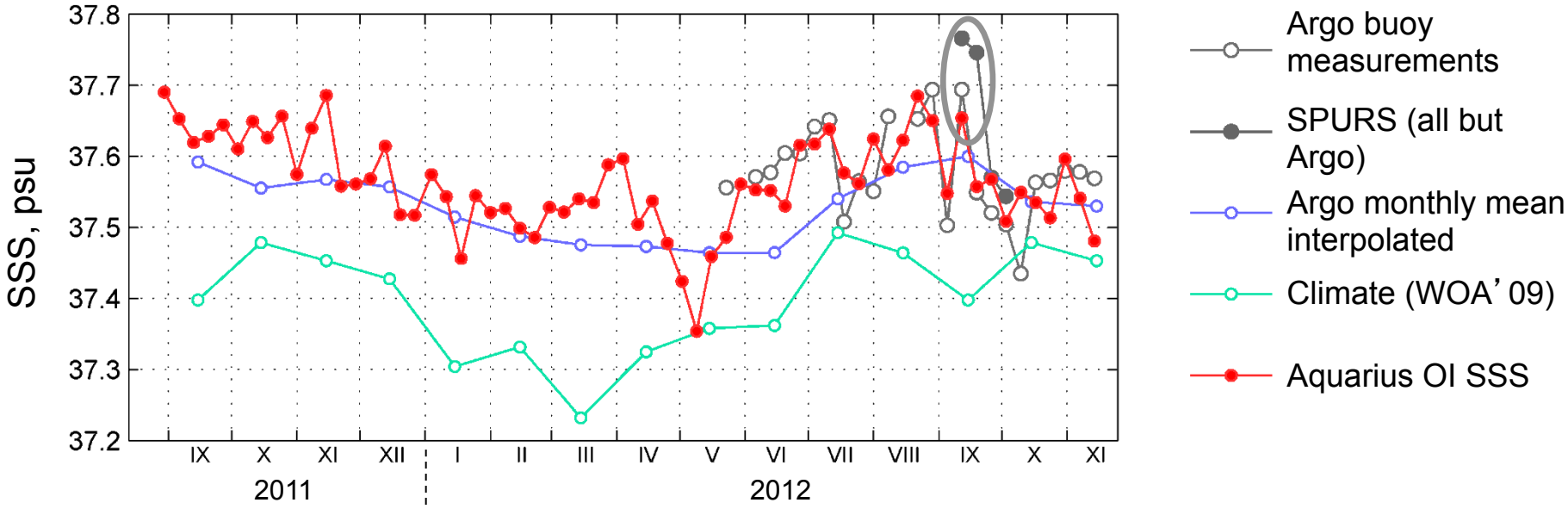
OI SSS interpolated onto Thalassa TSG line

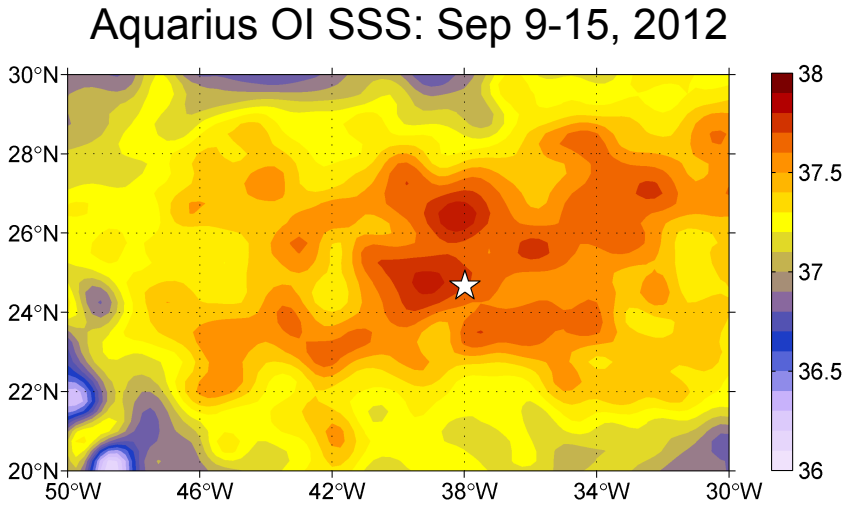
Dots show locations of Argo floats for the week September 9-15, 2012. Numbers show Argo near -surface (<6 m) salinity measurements.

SSS averaged in 2°x2° bin (39-37°W, 23.5-25.5°N) centered on the SPURS site

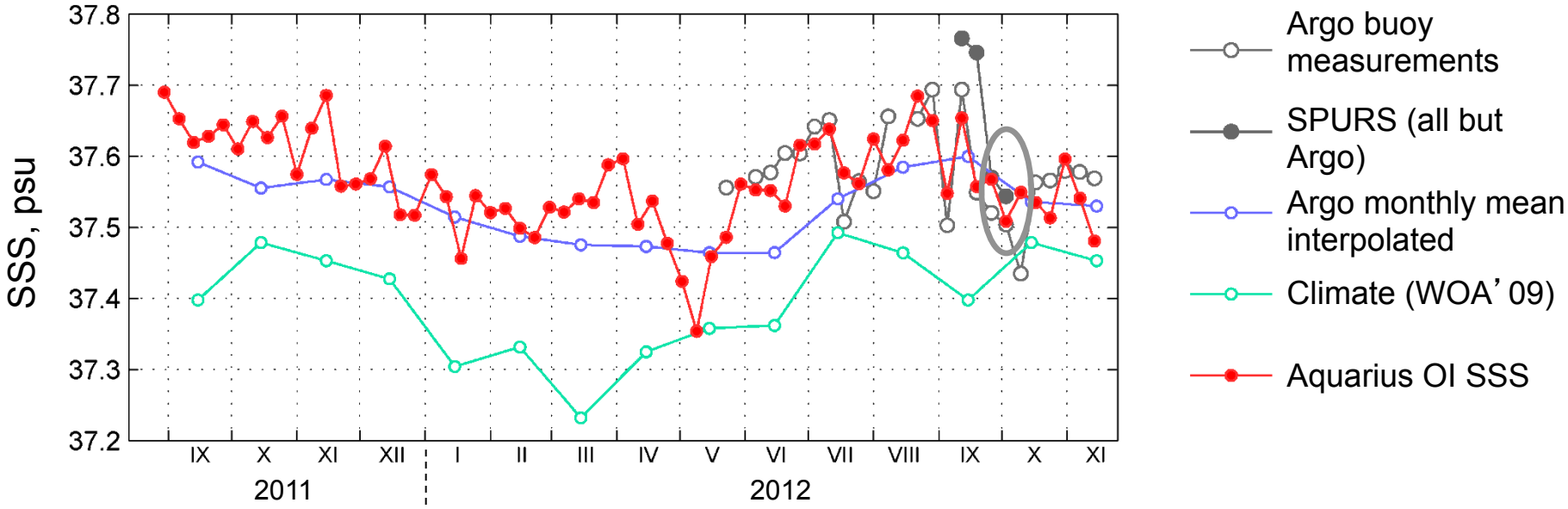


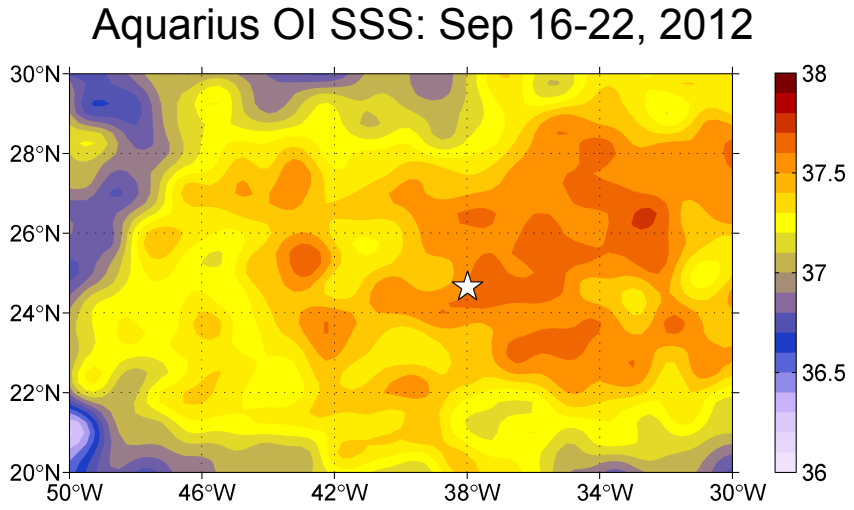
SSS averaged in 2°x2° bin (39-37°W, 23.5-25.5°N) centered on the SPURS site



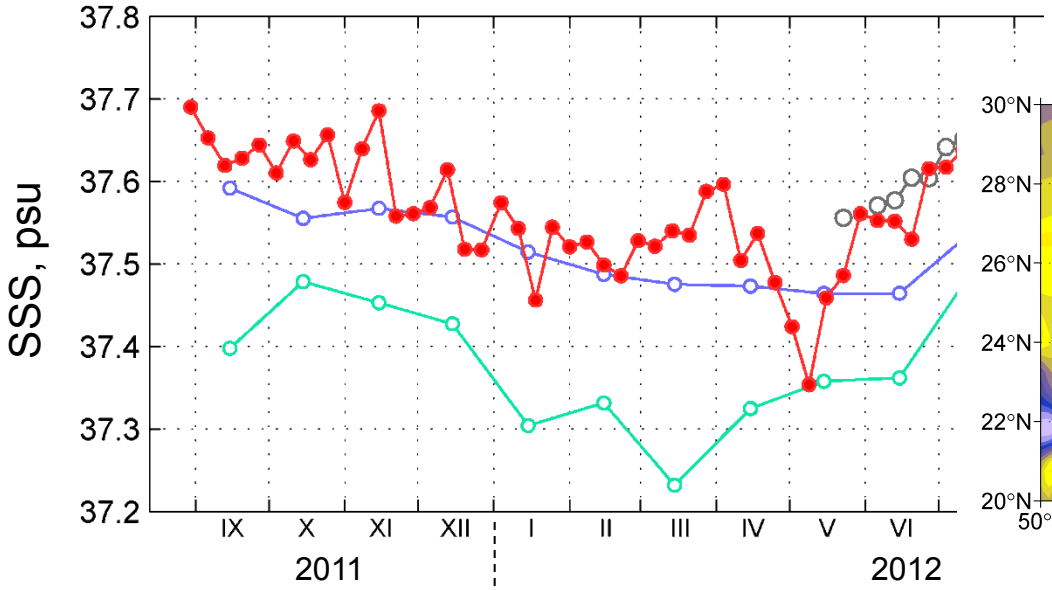


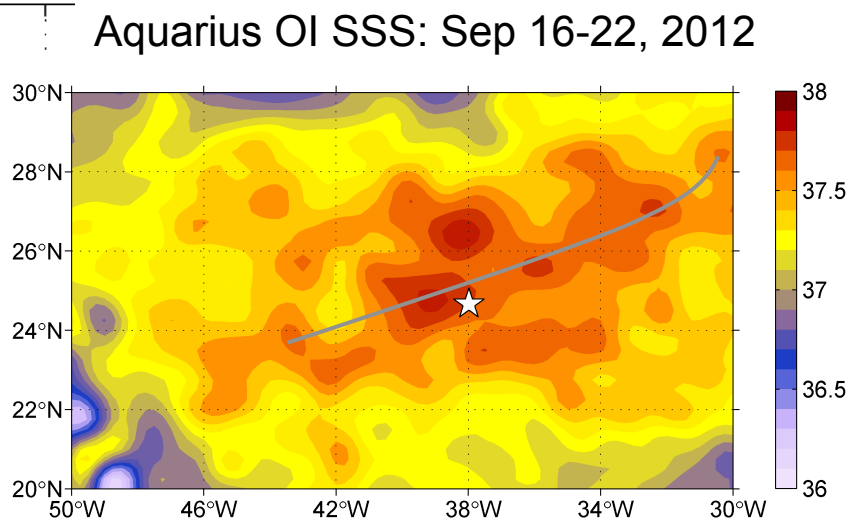
SSS averaged in 2°x2° bin (39-37°W, 23.5-25.5°N) centered on the SPURS site

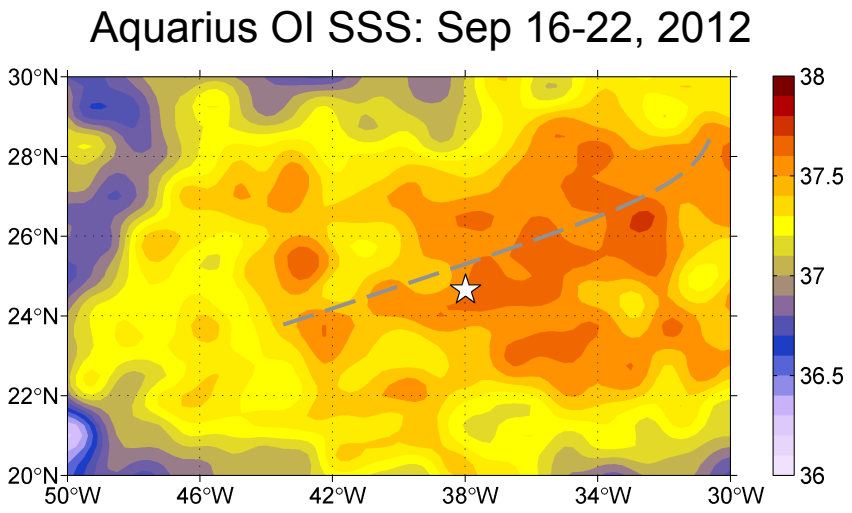




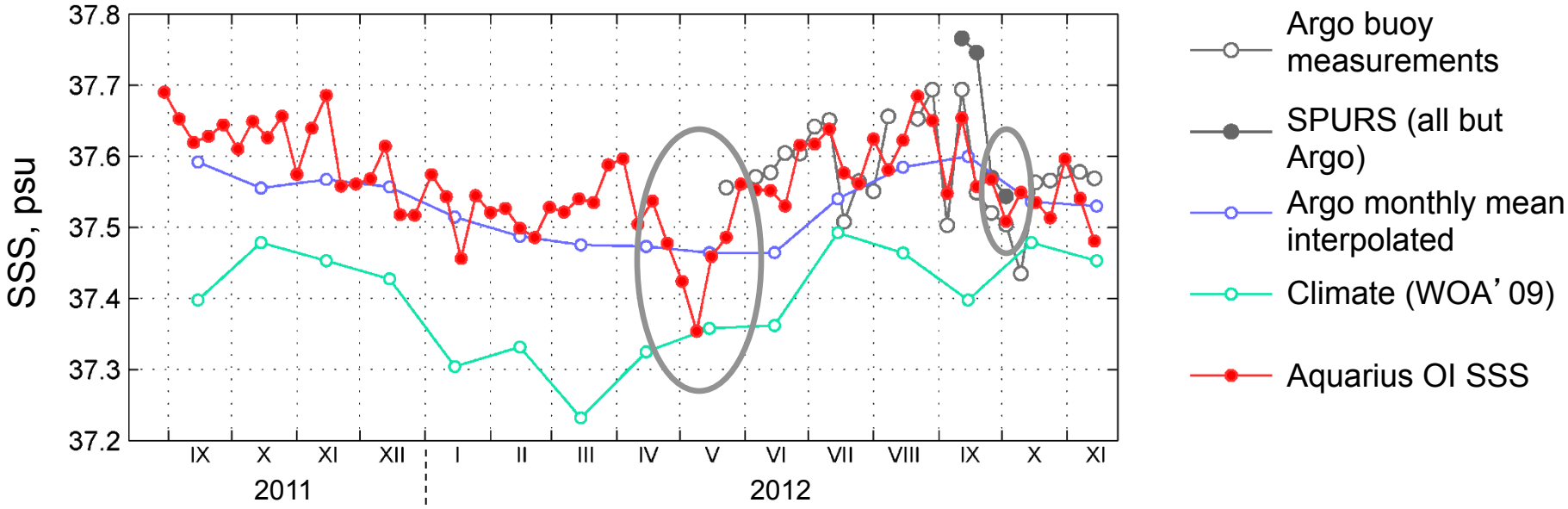
SSS averaged in 2°x2° bin (39-37°W, 23.5-25.5°N) centered on the SPURS site



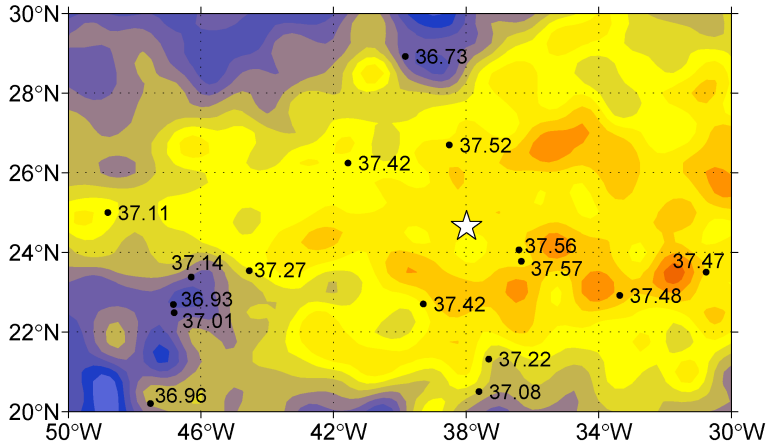




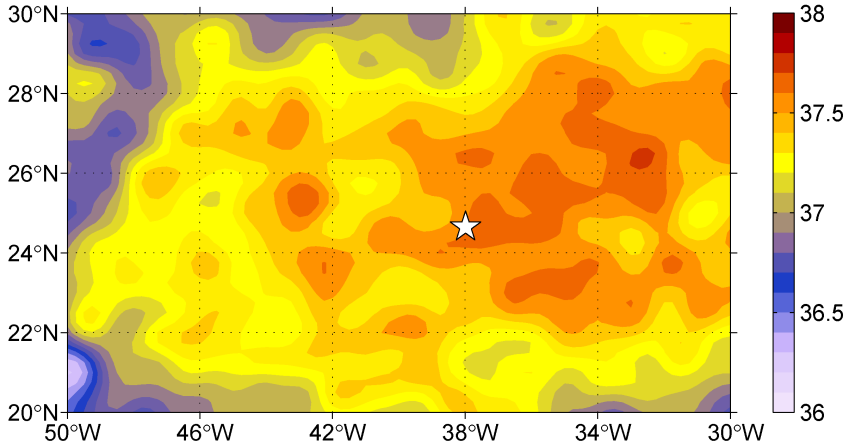
SSS averaged in 2°x2° bin (39-37°W, 23.5-25.5°N) centered on the SPURS site



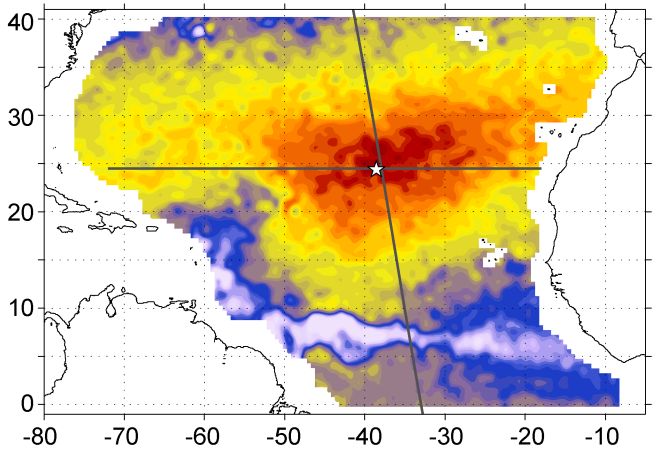
May 6-12, 2012

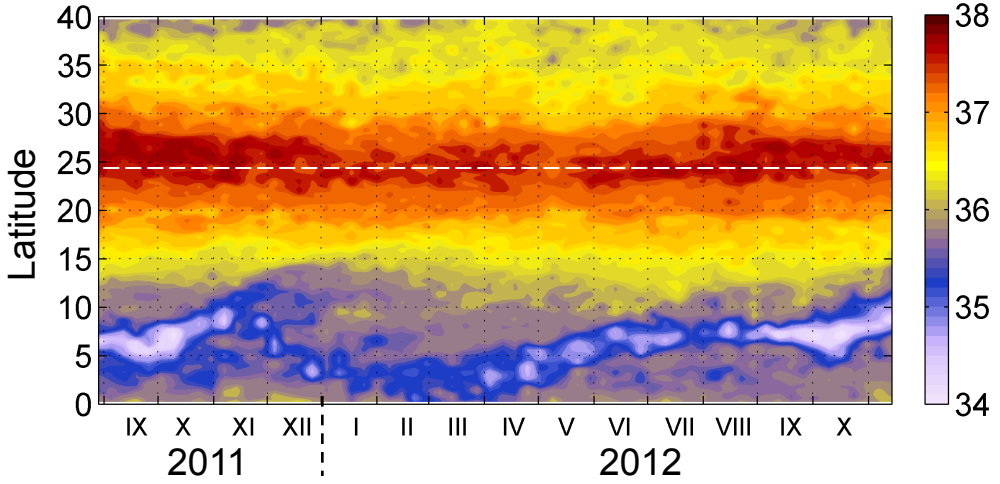


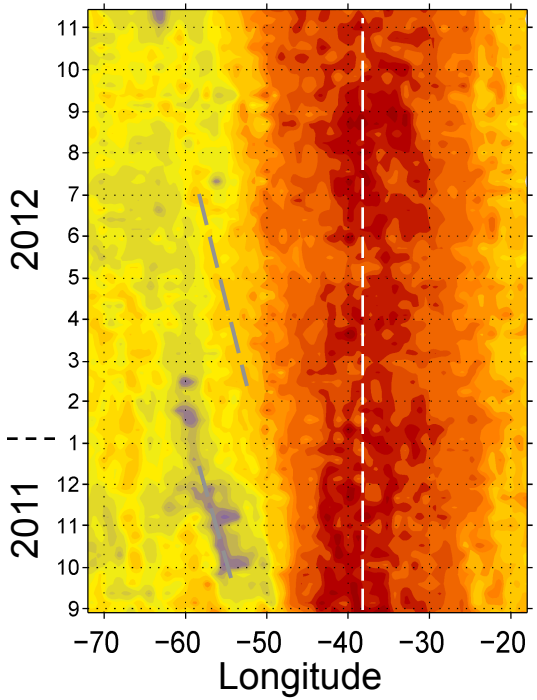
Aquarius OI SSS: Sep 16-22, 2012



Latitude-, longitude-time plots of SSS (Sep 2011-Nov 2012)







Aquarius OI SSS interpolated onto meridional, zonal lines passing through the SPURS site.

Data availability

Weekly SSS maps in the North Atlantic, based on the V2.0 Aquarius data, covering period staring from September 2011

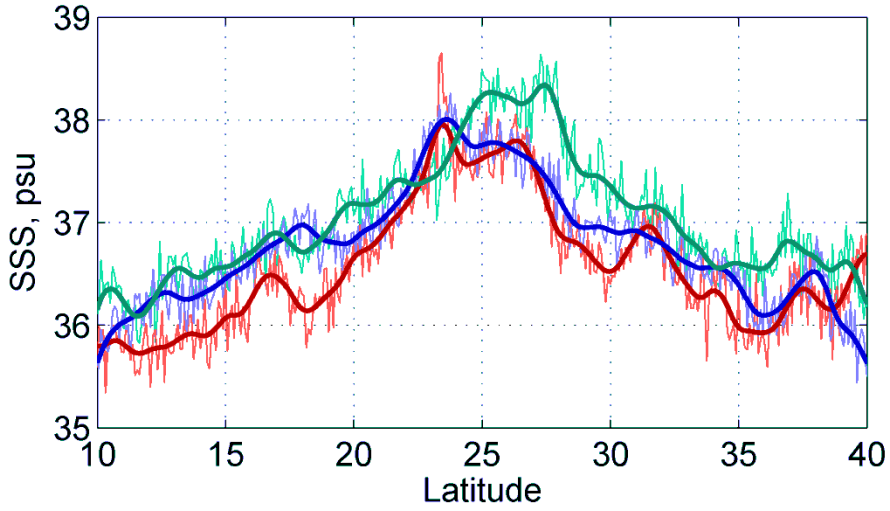
will be made available to the SPURS community once the validated data set V2.0 is released (expected yearly February 2013)

For now

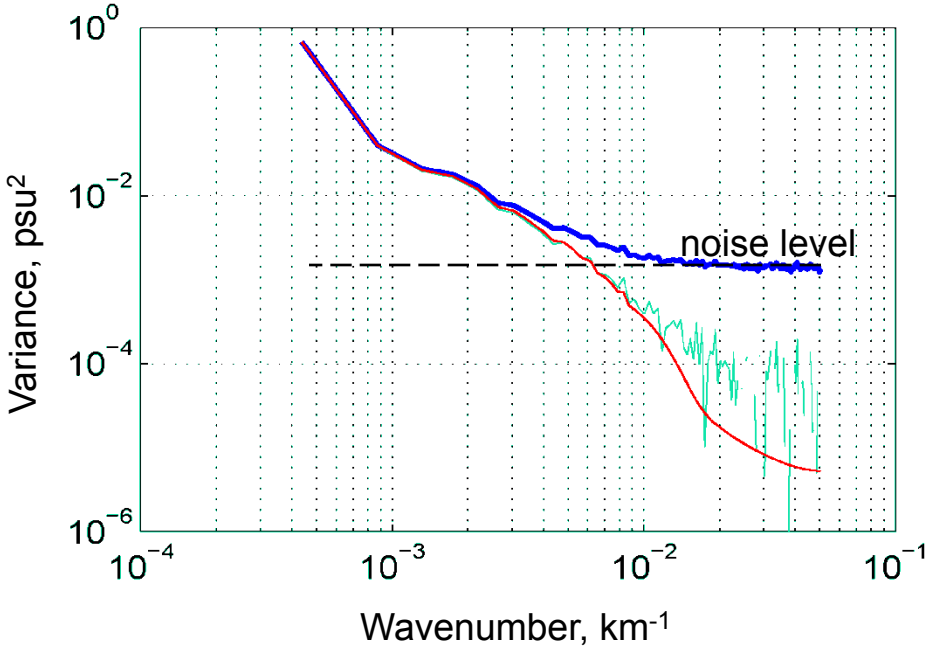
http://iprc.soest.hawaii.edu/users/oleg/OISSS/V1.3/

SSS_OI_NA_7D_2011_239-245_V13.nc

Thank you

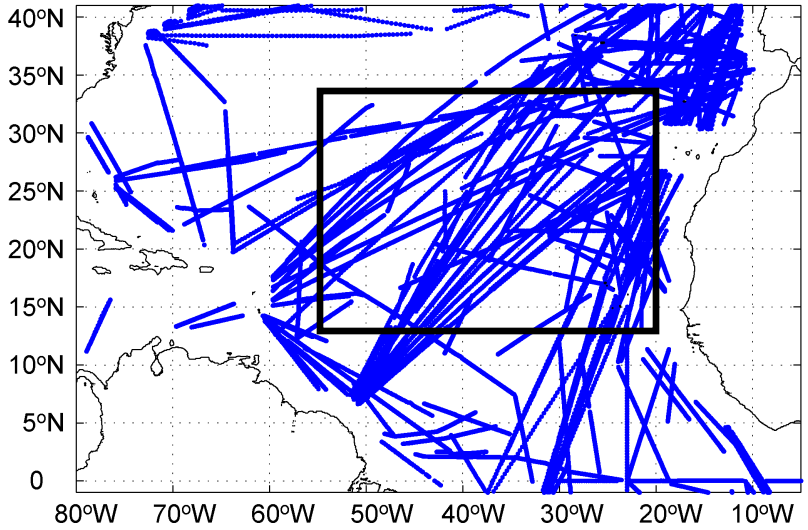


Example: 3 beams, 390-km wide swath (ascending) passing through the SPURS site on Sep 14, 2012. Thin curves – raw data; thick curves – smoothed with a running Hanning filter of half-width of ~60 km (approximately half-width of the Aquarius footprint). Green, red, and blue colors show 3 beams.



Mean along-track wavenumber spectra of SSS computed from the data of the Aquarius repeat track passing through the SPURS site. The blue and red lines represent the unfiltered and filtered data, respectively.

Back up slides



High-resolution TSG lines selected for the analysis